

Effect of ondansetron on sensory level produced by intrathecal bupivacaine

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ABSTRACT

Background: For spinal anesthesia there are drugs which can increase the level and quality of analgesia. Any drug which decreases sensory block level in spinal anesthesia is of great concern as it may need analgesic, sedative, supplement or even conversion to general anesthesia. Ondansetron is one such drug which has been reported to decrease the height of sensory block achieved after subarachnoid administration of bupivacaine. In this prospective observational study, we studied the effect of administration of ondansetron on the level of the sensory block achieved after subarachnoid blockade.

Methods: In Group II, 4 mg ondansetron was given and 15 mins before giving spinal anesthesia Group II against control group receiving 2 ml saline intravenous (Group I). 15 mins before giving spinal anesthesia. Both groups received 3.5 ml of bupivacaine heavy was given intrathecally. Sensory and motor block was assessed 5, 15, and 30 mins. We analyzed both highest spinal block level achieved and time to regress to L1 level.

Results: We found that in Group II both highest level of sensory block (T6 by median method) duration to regress to L1 level (1.43±0.22 hrs) was lesser as compared to group I and Group III T4 by median method and time to regress from T6 to L1 Group I 2.03±0.06 hrs Group III 1.84±0.27 hrs. Motor block did not differ between groups.

Conclusions: We concluded that probably ondansetron was responsible for lower spinal block level and early recovery from spinal anesthesia after intrathecal bupivacaine and should not be given empirically for nausea and vomiting.

Keywords: Intrathecal bupivacaine, Ondansetron, Sensory block level

INTRODUCTION

Bupivacaine provides longer duration of spinal anesthesia than lidocaine. Various drugs like opioids,¹ neostigmine,² clonidine,³ and nitrous oxide⁴ have been studied to prolong

the effect of sensory block. However, there are few drugs which decrease the duration and quality of spinal anesthesia which makes situation embarrassing for anesthesiologist e.g. nimodipine,⁵ granisetron⁶ causes decreased sensory level. Hence, any drug which decreases spinal block level

may compel anesthesiologists to supplement with sedative agents leading to unwanted oversedation or converting it to general anesthesia.

Ondansetron, a selective 5-HT₃ receptor antagonist was introduced for chemotherapy-induced nausea and vomiting, but now a days this is being increasingly used as premedication to prevent and treat nausea and vomiting in the operation room and in the post-operative period.

Interaction of any drug with any anesthetic technique is of great importance for anesthesiologist.

METHODS

In this prospective observational study 60 patients with aged 18-50 years, with ASA physical status I-II scheduled for various lower limb orthopedic procedures were selected for study after approval from Institutional Ethics Committee. Exclusion criteria were hearing impairment, treatment of any of chronic pain, nervous system disorder and intake of any type of analgesics, alpha 2 agonist or calcium channel blockers during last month. Patients were assigned to two groups of 40 patients each by Group I (control group) received 2 ml normal saline 15 mins before intrathecal bupivacaine. Group II received 4 mg of ondansetron 15 mins before intrathecal bupivacaine. Patients were assigned randomly to Group I and II as they came for registration for various lower limb orthopedic surgeries. Odd number patients to Group I and even number patients to Group II.

In operating room, non-invasive monitoring (electrocardiography, pulse oximetry, and non-invasive blood pressure monitoring) was used. Each patient received 500 ml of lactated ringer's solution over 15 mins before the spinal anesthesia. Subarachnoid injection was performed at L3-4 in lateral position using Quincke's 25 gauges needle. 17.5 mg (3.5 ml) of 0.5% bupivacaine heavy injected intrathecally.

Sensory level was checked along the four lines (1 - Anterior, 2 - middle, 3 - posterior axillary line and 4 - line 5 cm medial to anterior axillary line). Sensory block was assessed at 5, 15 and 30 mins with 27 gauge needle (pin prick method) point of highest sensory block was marked along the four lines moving in cephalic direction and dermatome was formed by line joining these marks. All measurements were made in the supine position and highest level of sensory blocked was noted at 30 mins. Patients were allowed to change position as per surgical requirement after 30 mins.

Duration of anesthesia was assessed by needle prick applied at L1 dermatome i.e. at the inguinal region, time taken from highest level of spinal block achieved to the time when patient complains of pain in inguinal region. Patients were grouped according to the highest block level achieved.

Statistical analysis

Sample size calculation was based on a projected difference of two segments in success rate among the two groups. Based on this, we calculated a sample size of minimum 20 patients per group, which would permit a Type 1 error of $\alpha = 0.05$ with a Type II error of $\beta = 0.5$ and power of 0.8. Data were presented as mean and standard deviation or percent of patients. The Chi-square test was used to compare categorical variables. Statistical difference was defined as $p < 0.05$.

RESULTS

The demographic and other data are depicted in Table 1. The patients matched regarding demographic data. There was no significant difference ($p > 0.05$) in age, height and weight in both the groups.

Level of the sensory block in each group at 5, 15 and 20 mins after spinal anesthesia was assessed, but there was no significant difference between the groups.

After 30 mins, highest level in different groups was assessed. In each group, distribution pattern was studied with regard to type of treatment and time. In Group I, the highest level of spinal block varied from T4 to T8, of which 70% achieved T4, 25% T6, 5% T8. However, in Group II percentage of patient achieving T4 was only 10%, T6 was 55%, T8 was 30%, and T10 was 5% as highest spinal block level (Table 2). We have analyzed maximum spinal block level in different groups by Chi-square test and median method.

With Chi-square method, there was significant difference between Group I and Group II ($p = 0.00123$). With median method, most of the patient in Group I and II achieved T4 and T6 as their highest spinal block level. Both the statistical

Table 1: Demographic data (mean±SD).

Data	N=40	
	Group I	Group II
Age (years)	27.7±5.66	28.9±7.59
Height (feet)	5.0485±0.0256	5.0550±0.0263
Weight (kg)	53.4±0.023	54.1±0.034

SD: Standard deviation

Table 2: Highest level of spinal block achieved in different groups N (%).

Spinal block level	Group I	Group II
T4	14 (70)	2 (10)
T6	5 (25)	11 (55)
T8	1 (5)	6 (30)
T10	-	1 (5)

Highest level of spinal block achieved in Group I was at T4 while that in Group II was at T6. With Chi-square method, there was significant difference between both ($p = 0.00123$)

methods indicate there is significant difference between Groups I versus II.

On comparing, the times to regress to L1 level in those patients who have achieved T4 as highest spinal block level different groups. Mean time to regress to L1 level was 2.53 ± 0.39 and 1.53 ± 0.18 hrs in Group I and II, respectively (Table 3). p value for Group I versus II was <0.01 which is significant. To countercheck the above results we analyzed the regression time to L1 in patients who have achieved T6 as their highest spinal block level in both groups. We found that mean time was 2.03 ± 0.06 , and 1.43 ± 0.22 hrs in Group I and II, respectively (Table 4). Value for Group I versus II were <0.01 which is significant.

DISCUSSION

The present study was designed to evaluate the effect of ondansetron on the level of sensory block produced by intrathecal bupivacaine. The mechanism of action of ondansetron in decreasing the level of block is still not well understood, but perhaps the role of serotonin also plays a role in analgesia produced by the intrathecal local anesthetic agent.

There are studies on animal model or indirect clinical studies present, but only few studies were done on human patients. Electrophysiological and behavioral studies in animals have clarified the antinociceptive mechanisms of the descending serotonergic system at the spinal cord level.^{7,8} There was reversal of antinociceptive effects of intrathecally administered serotonin in rat by selective 5-HT₃ receptor antagonist.⁶ Ondansetron blocked nifedipine induced analgesia in rats.⁹ After intrathecal injection of 0.5% bupivacaine both cerebrospinal fluid (CSF) and plasma, serotonin were determined radio enzymatically before and after anesthesia no change in plasma serotonin level but 300% increase in CSF serotonin level. Increase in serotonin level in CSF may contribute for analgesic effect of

bupivacaine.¹⁰ Stimulation of periaqueductal gray produced behavioral analgesia with increased levels of serotonin, norepinephrine, epinephrine, and glycine were raised.¹¹

Coadministration of ondansetron with tramadol leads to early post-operative pain score increased by 25%.¹² Likewise ondansetron reduces the overall analgesic effect of tramadol probably by blocking spinal 5-HT₃ receptors.¹³ In patients undergoing various transurethral procedures after effective blockade of serotonin receptor by giving ondansetron before spinal anesthesia showed decreased block level produced by intrathecal lidocaine.¹⁴ Similarly, intravenous granisetron facilitated a faster recovery of sensory block after bupivacaine subarachnoid anesthesia.¹⁵

In our study, we found that group which received ondansetron preoperatively did not achieve higher spinal block level as compared to those did not received ondansetron or received ondansetron after spinal anesthesia. Our results are consistent with the study done Fassoulaki et al. which showed decreased spinal block height level who received ondansetron prior to intrathecal lidocaine. Furthermore, when we compared the regression time in each group we found that group which received ondansetron preoperatively had a lesser duration of anesthesia as compared to those did not received ondansetron. There were no differences in bromage scoring within two groups. We had conducted this study in lower limb surgery, whether this is applicable on abdominal surgeries too. More studies are required to establish this fact and also what is the minimum dose and timing of ondansetron before administration of spinal anesthesia which can antagonize level of the sensory block.

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Ethical approval: The study was approved by the Institutional Ethics Committee

Table 3: Comparison of regression time to L1 among those patients, who have achieved T4 as highest level of spinal block.

	Group I	Group II
Number of patients	14	2
Mean±SD	2.53 ± 0.39	1.53 ± 0.18

SD: Standard deviation

Table 4: Comparison of regression time to L1 among those patients, who have achieved T6 as highest level of spinal block.

	Group I	Group II
Number of patients	5	11
Mean±SD	2.03 ± 0.06	1.43 ± 0.22

SD: Standard deviation

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